LABORATORY EQUIPMENT FOR ELECTROGRAPHIC EXAMINATIONS

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Hitherto the predominant aims of electrography of conducting ores and minerals — to supplement ore microscopic examinations — were as follows:

a) One of them was to identify chemically, rapidly, without injury of the surface the polished ore section involved by means of establishing the presence of the metals playing partly a dominant role in the composition of the mineral and partly occurring only in small amounts as impurities. By using suitable specific reagents the prints obtained provide a quick answer to the questions whether or not the assumed metals are present, or absent, in the ore examined. This simple electro-spot testing may be particulary useful for the identification of numeros sulphide minerals only varying very slightly from one another.

b) Another aim of electrography was the analysis of the surface of the polished ore section, the recording of distributive pattern to ascertain which of the components of a heterogeneous ore association contain a given metal, i. e. how the granules containing the given metal are distributed in the matrix. In most cases the distribution of the inclusions is far more marked on the print — which represents the map of the surface of the polished ore section — than on the polished ore section itself.

c) Furthermore, the electrographic procedure is very suitable for some special applications as for the examination of macrostructure, for the examination of the porosity and discontinuities of protective coatings, for structur-etching of metals, alloys and ores.

The equipments used to achieve the aims outlined above are fairly simple. A thick filter paper is placed onto an aluminum or stainless steel plate and the reagent paper is put on the filter paper with its gelatinous surface turned upwards. The ore is pressed with its polished surface onto the reagent paper and the ore is connected to the positive pole of a battery, whereas the base plate is connected to the negative pole. The circuit may be very simple, consisting of the battery, a push-button switch, a rheostat and a milliammeter.

For examinations in series, when it may be necessary to compare the prints, the reproducibility of the prints is also essential. In the case of semiquantitative measurings, the reproducibility of the conditions of

the printing, i. e. the precise regulation and control of the voltage, the current and the time is particularly essential. Reports on examinations of semiquantitative character are very scarce concerning metals or alloys and fail completely as regards minerals in the literature. For these examinations the simple equipment mentioned above suitable for qualitative spot testing, recording of distributive pattern, or for examination of macrostructure is insufficient.

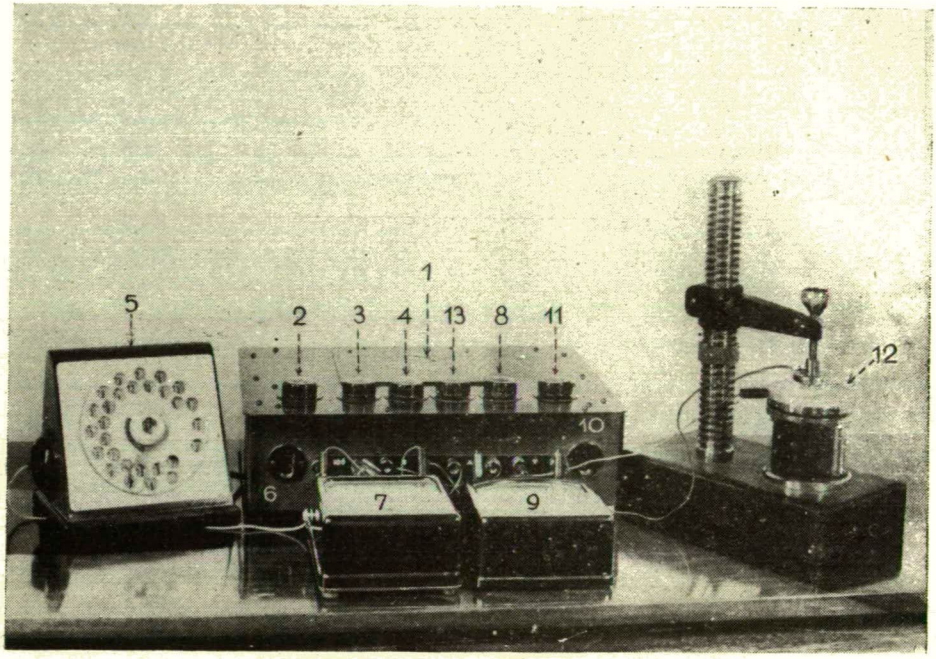

Fig. 1. The electrographic equipment

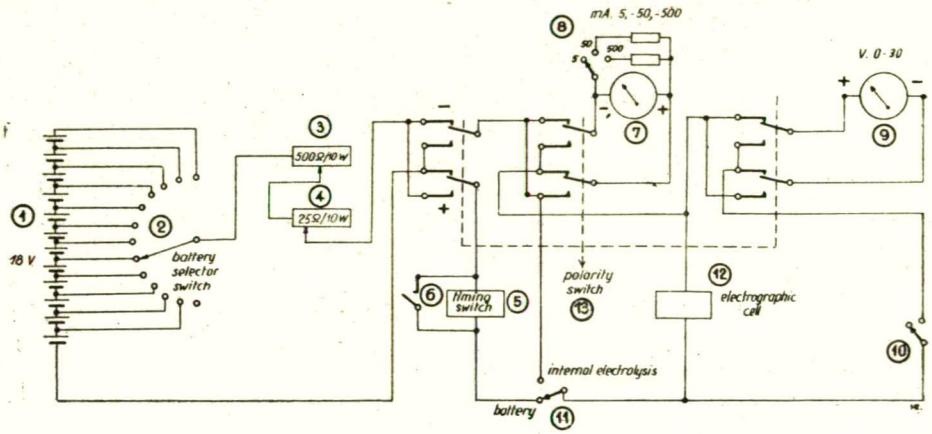

Fig. 2. Wiring diagram of the equipment

In the case of examinations in series or semiquantitative measurings the voltage, the current, the time and pressure must be controlled.

Recently *H. W. Hermance* and *H. V. Wadlow,* as well as *J. Chervet* and *R. Pierrot* have published reports on electrographic equipment suitable for precisions work. These descriptions provided in part the basis for the construction of the equipment used for the electrographic printing in our Institute.

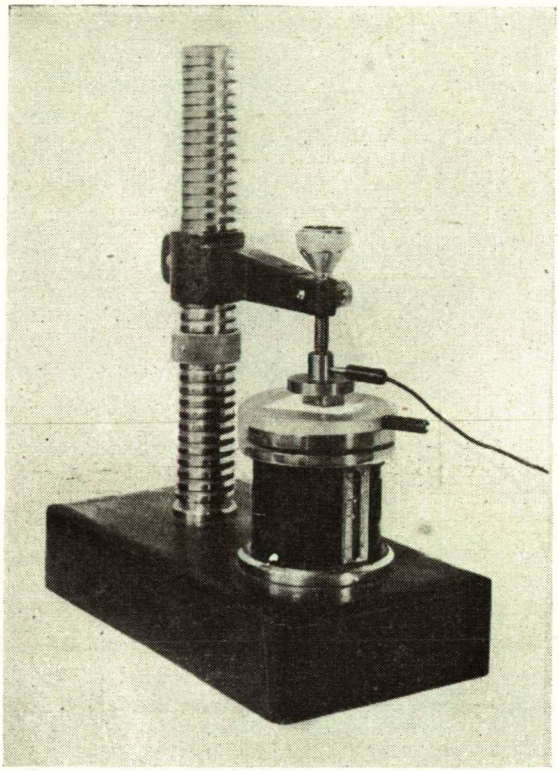

Fig. 3. The electrographic press

The current supply consists of 12 — each 1,5 volts — flashlight cells placed into a box built into the equipment (1). The voltage may be supplied by a battery selector switch (2) in steps of 1,5 volts to the electrographic cell (12). The further regulation of the voltage is provided by two rheostats in series one of which of 500 ohms (3) furnishes the coarser and that of 25 ohms (4) the finer regulation. Considering that in certain cases the calculation of the quantity of the dissolved ions is necessary an accurate timing may be also needed a timing switch (5) is inserted into the circuit as well. Should the accurate timing be not necessary it may be short circuited by a switch (6). The voltmeter may also be cut off by a switch (10). As it may also occur that the examinations of different ore samples ought to be carried out without external power the battery, the battery

selector switch, the rheostats and the timing switch may also be cut off by a switch (11) and the circuit may be closed between the electrodes through the milliammeter. The milliammeter (7) and the voltmeter (9) are not built into the equipment. They are portable meters with a length of scale of 130 mm furnishing a more precise reading. The milliammeter is correspondingly shunted and can be switched by a scale selector switch (8) in scale ranges of 5, 50 and 500 milliamp. respectively. The scale ranges of the voltmeter are 3 and 30 volts, respectively. The resistance of the voltmeter is 1000 ohms/volt. In the course of the printing it may be that the changing of the direction of the current through the printing cell is necessary. Therefore, a polarity switch (13) is inserted into the circuit. However because of the fact that not meters of zero-center typ are used, the polarity switch simultaneously automatically changes the poles of the meters too.

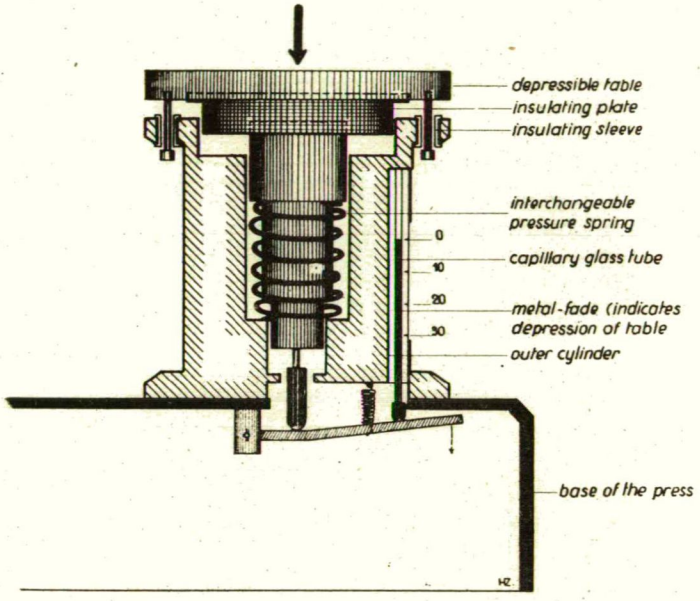

Fig. 4. Cross-section of the electrographic press

To ensure the reproducibility of the prints the regulation and control of the pressure is also essential. Fig. 3. illustrates the press and Fig. 4. its cross-section.

The construction of the press is well visible on the cross section. An interchangeable coil spring of desired strength is inserted into the metal cylinder fixed to the base of the press and the depressible table of the press is supported by this spring. The depressible table is well insulated from the other parts of the press. The axis of the depressible table passing through the coil spring exerts more or less pressure — depending upon the pressure applied — upon an arm fixed on one end. The other end of this arm lifts up or lowers down a metal thread inserted into a capillary

glass tube. The capillary glass tube is inserted into the frontal part of the outer cylinder fixed to the base of the press beside a metal plate provided with a scale. If no pressure is exercized the upper end of the metal thread movable in the glass tube coincides with the zero mark of this scale and when a load is applied it sinks according to the extent of the pressure. Thus, if examinations in series are made one must only pay attention that — using springs of the same strength — the end of the metal thread always sinks down to the same mark on the scale thus ensuring the regulation of an identical pressure.

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